

## Design of Bidirectional PFC Totem Pole for OBC

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**Abstract :** In the current context of European and global energy transition and the accelerated integration of renewable energies, the transition to electric vehicles with V2X (Vehicle-to-anything) charging options is favored to enhance the power grid and to serve as an energy supply in peak demand periods. Regarding the fast development of EV charging infrastructures, a cost-effective and efficient solution is required to meet OEM's (Original Equipment Manufacturers) needs. In this context, a single-phase 7.4 kW bidirectional on-board charger with G2V, V2G and V2L capabilities has been developed to support faster charging. The proposed architecture consists of two power stages. A Totem Pole PFC stage works as a rectifier in G2V with a unity power factor and as an inverter in V2G and V2L. The second stage is a CLLLC resonant converter selected to achieve higher energy efficiency, ZVS and ZCS and cost-effectiveness. SiC technology is used for switching devices to maximize power efficiency by lowering switching losses and to improve power density by minimizing the size of filters and passive components. Pulse frequency modulation (PWM) control is used for the Totem Pole PFC and pulse frequency modulation (PFM) control is used for the CLLC stage to control the stage gain in both energy transfer directions. In the context of validating the topology, this paper elaborates the simulation and the performance evaluation of the first power stage in the Matlab/Simulink environment.

**Keywords :** V2G, V2X, OBC, CLLC.

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